CHAPTER 44

PAPER BIRCH TYPE

TYPE DESCRIPTION

A. Stand Composition

Paper birch (*Betula papyrifera*; also called white birch) comprising more than 50 percent of the basal area in sawtimber and pole timber stands, or more than 50 percent of the stems in sapling and seedling stands. Mainly found where the climate has short, cool summers and long cold winters and where one-third to one-half of total precipitation falls as snow.

B. Associated Species

Large pure stands are uncommon. Most commonly found in association with **aspen** (*Populus* spp.), **balsam fir** (*Abies balsamea*), **jack pine** (*Pinus banksiana*), **red oak** (*Quercus rubra*), **sugar maple** (*Acer saccharum*), **white spruce** (*Picea glauca*), **yellow birch** (*B. allegheniensis*), and **American beech** (*Fagus grandifolia*).

C. Soil Preference

Grows best on deep well-drained soils with good fertility, especially sandy loams (podzol or gray-brown and brown podzolic soils), glacial tills and outwash.

D. Range of Habitat Types

Commonly found on AQV, PMV, AVDe, AVVib, ATM, ATD, AFD, AA, and TMC (Kotar et al., 1988). All of these except AQV fall within the Medium or Rich nutrient regimes and the Dry Mesic or Mesic moisture regimes. AQV is in the Poor nutrient regime and Dry moisture regime. Paper birch growth is better on the richer, moister types (ATM, ATD, and AFD).

NOTE: Paper birch is an early successional species and will not be the climax species on any habitat type.

SILVICAL CHARACTERISTICS*

Species	Paper birch
Flowers	Dioecious; mid-April until early June
Fruit Ripens	Early August until mid-September; light (1.5 million seeds per pound), winged seed readily dispersed by wind.
Seed Dispersal	Begins soon after ripening and continues through the fall and winter, with 90 percent of seed falling before November.
Good Seed Years	1 in 2 years with a bumper crop 1 in 10 years.
Germination	Best germination and early survival on exposed mineral soil and in partial shade. Growth is better on humus seed beds in 50 percent or greater sunlight. Scarification, disking, or light burning produces the best seed beds. Dormancy is not usually displayed but cold, moist stratification at 41°F for 60 to 75 days may be needed to break dormancy of stored seed.
Seed Viability	Lost quickly when stored unsealed at room temperature but may remain viable for 18 months if stored at room temperature at 1 percent moisture content.

Seedling Development	3 to 4 inches in the first year; 3 to 4 ft. in four years. Stump sprouts grow two ft. in first year, 6 to 8 ft. in four years.
Seed Bearing Age	Begins producing seed at 15 years; optimum age is 40 to 70 years. Reproduction normally from seed.
Vegetative Reproduction	Uncertain method for regeneration for commercial purposes. Will sprout after cutting or fire with the most prolific sprouting from young vigorous trees that were cut in spring to stump heights of 0.5 to 1 foot. Unlike aspen and oak, paper birch stump sprouts will not survive repeated deer browsing. Once browsed, paper birch usually will not resprout.
Shade Tolerance	Very intolerant; in the absence of disturbance will be replaced by more tolerant types -- most commonly northern hardwoods on well-drained mineral soil, or fir-spruce on shallow or poorly drained soils.
Major Pests	Paper Birch Pest Management Guidelines are included at the end of this chapter.

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* Compiled from Fowells (1965), and Safford and Jacobs (1983).

MANAGEMENT ALTERNATIVES

The management objective should be identified in relation to other land management objectives using the habitat type as the preferred indicator of site potential. Possible management alternatives include maintaining the type or converting to other species.

Paper birch will probably never do well on sites with a site index of 55 or less (see Figure 44.1). These sites should be considered for conversion to other species. Stands mixed with northern hardwoods can be considered for natural conversion but a careful evaluation should be made to determine how well the site is suited for northern hardwoods. This also holds true for stands mixed with fir or pine. When aspen is present, any regeneration effort will probably result in an increase in the aspen component and eventual conversion after one or more rotations. Forced conversion through planting or treatment can also be considered for other species (e.g., red pine, white pine, or red oak), depending on the habitat type.

SILVICULTURAL SYSTEM

Even-age management with regeneration through some form of clearcutting or by the shelterwood system. General thinnings are only necessary to release crop trees for sawlogs (on sites with site index of 70 or more) but can also be done on sites with site index less than 70 if stocking exceeds the A-level (see Figure 44.2).

MANAGEMENT RECOMMENDATIONS

A. Seedling/Sapling Stands (0-5" DBH)

If the site index is less than 70, allow the stand to develop naturally. When the habitat type is ATM, ATD, or AFD, or when the site index is greater than 70, remove brush and weeds to release crop trees.

B. Pole Timber Stands (5-11" DBH)

If the stand is at site index rotation age, either regenerate to birch or convert to another species (see Management Alternatives, above).

If the stand is within 10 years of rotation age or stocking is below the A-level (see Figure 44.2), no action is required.

If the stand is 10 years or more below the rotation age and stocking is at or above the A-level, thin to the B-level. Also when the site index is greater than 70, release crop trees during thinning.

C. Sawtimber Stands (>11" DBH)

If stand is at site index rotation age, regenerate. When it is below rotation age, treat as recommended for pole stands.

D. Regeneration

Scarification or exposure of mineral soil is critical for successful regeneration of paper birch. However, tilling for weed control and to expose mineral soil may deprive birch seedlings of nutrients from woody litter. Disc scarification is recommended (Perala, 1985).

1. Shelterwood System

   The initial cut should be from below to leave 20 to 40 percent crown cover (Perala, 1988). Summer logging is recommended to improve seed bed by scarification and to reduce the sprouting vigor of competing vegetation. Do not cut any aspen during the initial cut to minimize sprouting competition.

   Remove the overstory two to four years after the initial cut when seedlings are about waist height. This final cut should be done in winter to minimize damage to paper birch seedlings and sprouts.

2. Patch Clearcuts

   Clearcutting small irregularly shaped patches of less than one acre is especially useful on small tracts, roadsides, parks, or any area where consideration of available space or potentially adverse aesthetic impact is important. Summer logging is recommended and residual stems should be cut concurrently. Late summer or fall scarification might be needed also.

3. Clearcuts

   This technique is recommended only when other regeneration techniques are unfeasible for reasons such as terrain, geographic layout, merchantability, operability, etc. Regeneration will be from stump sprouts and seed. Winter cutting, after fall seed dispersal, may be desired. Three to five trees per acre should be left as a seed source if cutting is done before seed dispersal. Cut residual concurrently.

   NOTE: In a clearcut, factors influencing regeneration may favor species other than paper birch, thereby causing natural conversion.

REFERENCES

Carmean, W. H., J. T. Hahn, and J. D. Jacobs. 1989. General Technical Report NC-128, Site index curves for forest tree species in the eastern United States. USDA-Forest Service, North Central For. Exp. Sta.: St. Paul, MN.

Fowells, H. A. 1965. Agric. Handbook No. 271, *Silvics of forest trees of the United States*. USDA-Forest Service: Wash., D. C. p. 93-98.

Kotar, J., J. A. Kovach, and C. T. Locey. 1988. *Field guide to forest habitat types of northern Wisconsin*. Univ. Wisconsin-Madison and Wisconsin Department of Natural Resources. 217 pp.

Marquis, D. A., D. S. Solomon, and J. C. Bjorkbom. 1969. Research Paper NE-130, A silvicultural guide for paper birch in the northeast. USDA-Forest Service: Northeastern For. Exp. Sta.

Perala, D. A. 1985. Scarification requirements for regenerating paper birch (*Betula papyrifera*) under shelterwood. IUFRO Symposium on the Equipment/ Silviculture Interface in Stand Establishment Research and Operations: Jasper, Alberta. Sept. 29 - Oct. 3.

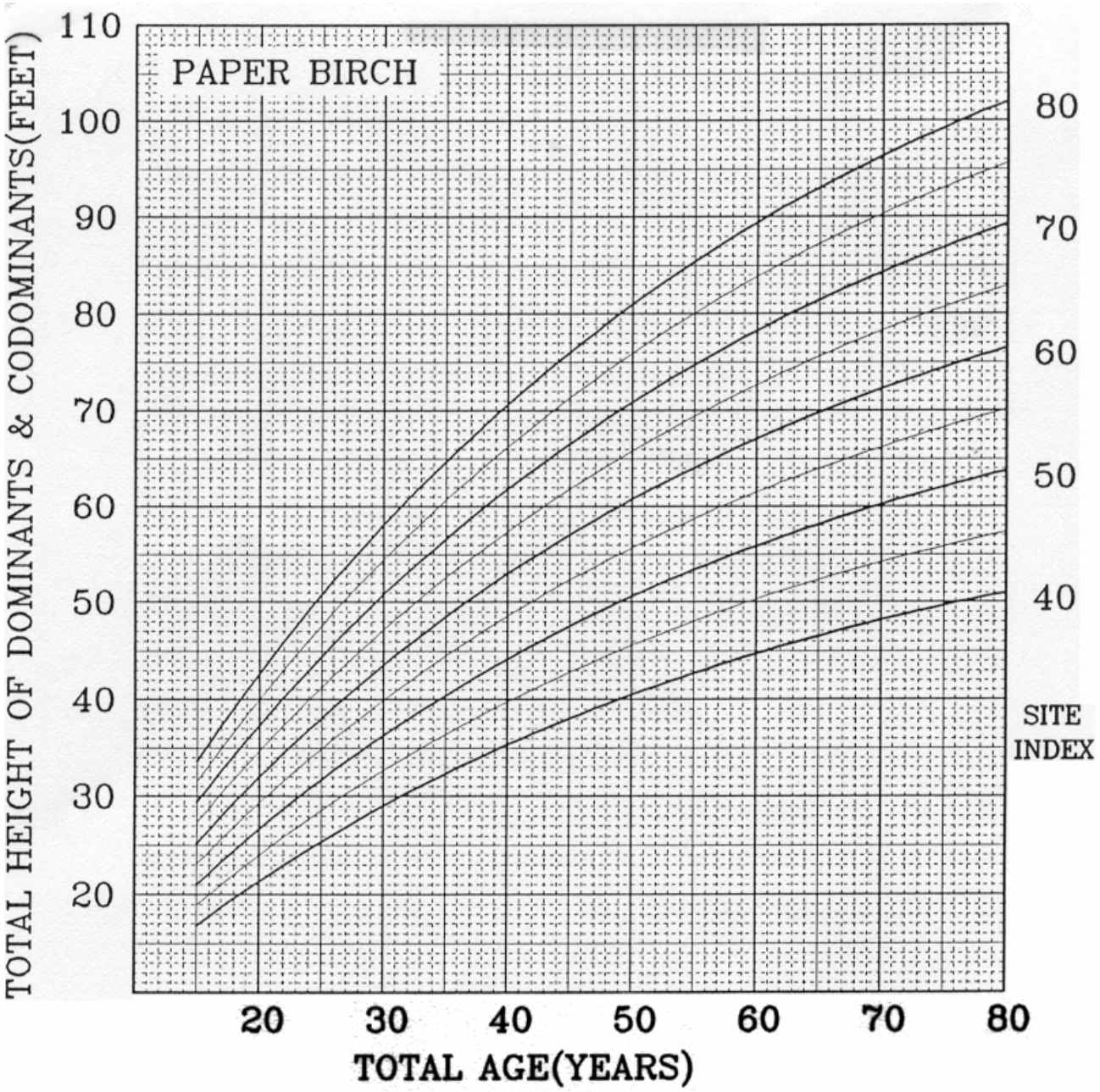
Perala, D. A., and A. A. Alm. 1988. Regenerating paper birch in the Lake States with the shelterwood method. Northern J. Applied Forestry., vol. 6, no. 4, p. 151-153.

Safford, L. O. 1983. Research Paper NE-535, Silvicultural guide for paper birch in the northeast (revised). USDA-Forest Service, Northeastern For. Exp. Sta.

Safford, L. O., and R. D. Jacobs. 1983. "Paper birch" in Agric. Handbook No. 445, *Silvicultural systems for the major forest types of the United States*. USDA-Forest Service: Wash., D. C. p. 145-147.

Figure 44.1 Site index for paper birch in northern Wisconsin and upper Michigan (Carmean et al., 1989).

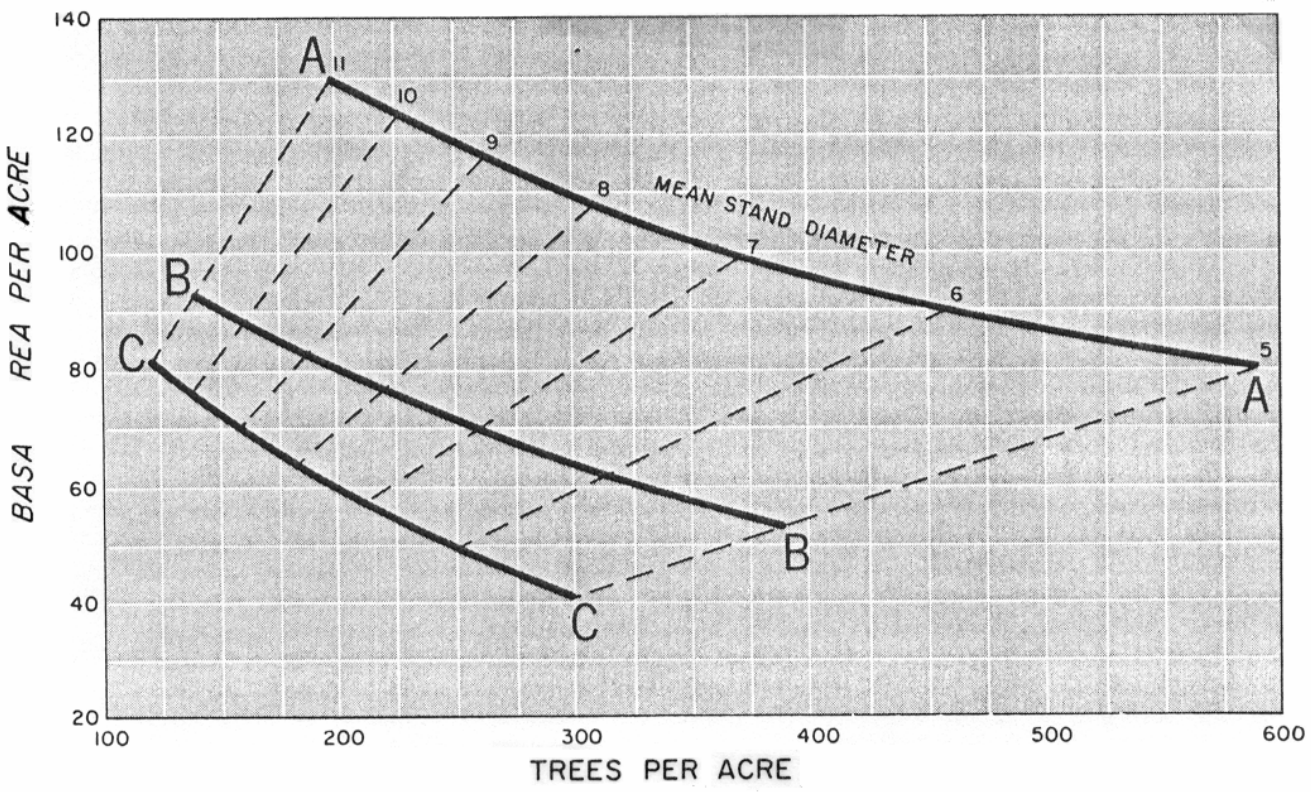
Site index	80	70	60	50	40
Rotation age (years)	90	80	70	60	50



Paper birch (Cooley 1958, 1962)
Northern Wisconsin (104 plots); Upper Michigan (4 plots)
108 plots, number of dominant and codominant trees not given
Total height and age, anamorphic, equation not given
Add 4 years to d.b.h. age to obtain total age (BH = 0.0)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.5980	1.0000	-0.0198	0.9824	0.0000	0.99	0.32	0.6
SI	0.6258	1.0000	-0.0198	-0.9824	0.0000	0.99	0.32	0.6

Figure 44.2 **Stocking guide showing relationship of mean stand diameter to basal area and number of trees per acre for paper birch in the northeast (Marquis et al., 1969).**



The area above the A-level represents overstocked conditions. The area between the A and B-levels represents adequate stocking. The area between the B and C-levels should be considered as slightly understocked because the stand will return to the B-level in 10 years or less. The area below the C-level is definitely understocked. Only trees in the main crown canopy (dominants, co-dominants, and intermediates) should be included in stand measurements to be used with this stocking guide.

HAZARD	LOSS OR DAMAGE	PREVENTION, MINIMIZING LOSSES AND CONTROL ALTERNATIVES	REFERENCES
FOLIAGE PESTS			
Birch Leafminer	Periodic outbreaks of early summer leaf destruction in stands of all ages resulting in growth loss and contri-buting to birch dieback.	No direct controls practical. Monitor heavily defoliated stands for birch dieback.	Birch symposium proceedings. 1969. USDA Forest Service, NEFES. Birch (***Betula***) Disorder: Birch Leafminer, P. Pelletteri. UW Ext. Urban Phytonariarn, A2117.
Birch Skeletonizer	Periodic outbreaks of late summer leaf skeletonizing in pole and sawlog stands lasting 2-3 years. Causes some growth loss and may seriously weaken tree when it occurs in conjunction with birch leafminer.	No direct controls practical.	Birch Symposium Proceedings. 1969. USDA Forest Service, NEFES.
Forest Tent Caterpillar	Periodic outbreaks of spring defoliation in aspen that may also defoliate nearby birch stands.	No direct controls practical.	Forest Tent Caterpillar. 1978. H.O. Batzer, et al. USDA-Forest Service. Forest Insect and Disease Leaflet 9.
MAIN STEM AND ROOT PESTS			
Bronze Birch Borer	Destruction of inner bark causing decay entry, wood deformity and tree mor-tality, occurs in stands under stress from drought, defoliation or physical damage.	After defoliation or drought monitor for signs of borers and harvest if necessary.	Birch symposium proceedings. 1969. USDA Forest Service, NEFES. Birch (***Betula***) Disorder: Bronze birchborer. P. Pelletteri, et al. UW Ext. Urban Phytonarian A2692.
Ambrosia Beetles	Tunneling in wood of weakened trees results in defect in wood products.	After defoliation or drought monitor for signs and harvest if necessary.	Birch symposium proceedings. 1969. USDA Forest Service, NEFES.
Sapsuckers	Wounds in bark result in wood decay and discoloration and occasional tree mortality.	Leave attacked tree in place limiting attack to one tree. Remove dead aspen (nesting trees).	How to Identify and Control Sapsucker Injury on Trees. M. Ostry, et al. 1976. USDA Forest Service.

Canker Rots (***Inonatus obliquas and Phellinus ignarius***)	Wood decay. Entry through wounds. These fungi are not compartmentalized and continue to attack newly formed wood.	Prevent wounding. Monitor storm damaged stands for symptoms and harvest if necessary.	
Shoestring Root Rot (***Armillaria mellea***)	Generally present in root zone as an epiphyte. Attacks roots when the tree is weakened by drought, defoliation or bronze birch borer. Attack usually results in basal decay and collar cracking.	Monitor weakened stands for symptoms. Trees with collar crack should be harvested as soon as possible.	Silvicultural Guide to Paper Birch in the North East. 1969. USDA-Forest Service. Res. Paper NE130.
Birch Dieback	Twig dieback, growth loss and tree mortality due to stress from several sources: 1. Drought 2. Defoliation 3. On higher quality sites, competition from advance reproduction of more tolerant species.	More than 25% of crown dead or dying: 1. Harvest now. Less than 25% of crown dead or dying: 1. On smooth bark trees (younger trees), carry to next cutting cycle; then reevaluate. 2. On rough bark trees (older trees), harvest unless salvage reentry is planned for less than 5 years.	Silvicultural Guide to Paper Birch in the North East. 1969. USDA-Forest Service. Res. Paper NE130.